commercially available source, such as Tribune Media Services. In a preferred

embodiment, the DVR 110 periodically accesses the channel guide data server 126 to

download the most recent channel guide data and application software. The DVR 110

can also contact the software server 122 in response to a command from a user or a

module within the DVR.

[0019]   In a typical environment, the diagnostic 120 and software 122 servers are

remote from the DVR and may be in simultaneous communication with hundreds or

thousands of DVRs. The diagnostic 120 and software 122 servers preferably utilize

conventional hardware providing conventional Internet server functionality. In one

embodiment, the servers 120, 122 communicate with the DVRs via conventional

protocols such as the hypertext transport protocol (HTTP) and/or the file transfer protocol

(FTP). The DVRs and the servers 120, 122 preferably exchange messages in

conventional formats, such as the hypertext markup language (HTML) and/or extensible

markup language (XML). Alternative embodiments of the present invention utilize

different protocols and/or languages to communicate.

[0020]   FIG. 2 is a block diagram illustrating a high-level view of the components of

the DVR 110. The DVR 110 has a processor 210 for controlling the operation of the

DVR. The processor 110 is preferably a commercially-available microprocessor such as

a MIPS-based processor from Philips Semiconductors.

[0021]   The DVR 110 also has a media storage 212. Preferably, the media storage 212

is a high-capacity, rewritable, randomly-accessible recording medium such as a hard

drive. The media storage 212 preferably stores digitized television content 214, other

data, and program code modules 216 for controlling the operation of the DVR 110. In an

alternative embodiment of the DVR 110, the television content 214 and program code

modules 216 are stored on separate storage devices. As used herein, the term "module"

refers to software computer program code and/or any hardware or circuitry utilized to

provide the functionality attributed to the module. Modules are preferably stored in one

or more files in the media storage 212. However, the modules may be stored in other

locations and/or formats.

[0022]   It is not uncommon for a hard drive or other media storage 212 to suffer

occasional errors. These errors include failures to memory elements (e.g., bad sectors on

the hard drive), corruption to files or the file system, file fragmentation, etc. These types

of errors can cause the DVR 110 to suffer soft errors.

[0023]   The DVR 110 also contains a program code memory 218 for holding data and

program code modules 216 loaded from the media storage 212 or otherwise stored in the

program code memory. In one embodiment, the program code memory 218 includes

random-access memory (RAM) and read-only memory (ROM). The program code

memory 218 also preferably includes a nonvolatile memory 219, such as Flash RAM,

erasable-programmable read-only memory (EPROM), and/or another form of memory

that retains state in the absence of power. In one embodiment, the nonvolatile memory

219 is lockable to prevent accidental alteration.

[0024]   Preferably, program code modules stored in program code memory 218 cause

the processor 210 to load other program code modules 216 from the media storage 212

into the program code memory. The processor 110 then executes the program code

modules in the program code memory 218. In alternative embodiments of the present

invention, the program code modules are stored and/or executed from different locations

within the DVR 110.

[0025]   A network recovery module 221 is preferably stored in the nonvolatile

memory 219. In an alternative embodiment, the network recovery module 221 is stored

in the ROM or elsewhere in the program code memory 218. The network recovery

module 221 preferably contains program code enabling the DVR 110 to contact the

diagnostic 120 server, software server 122, and/or other remote server, such as a

dedicated server, even when some or all of the other modules in the DVR 110 are missing

or corrupt. Preferably, the network recovery module 221 contains an explicit address,

such as a toll free telephone number or an internet protocol (IP) address, specifying how

to contact the remote server. In addition, the network recovery module 221 contains

instructions enabling the DVR 110 to contact the remote server at the explicit address and

download and execute modules from the server. Thus, the network recovery module 221

enables the DVR 110 to engage in a recovery procedure even when the DVR has suffered

significant errors with the modules stored in the media storage 212.

[0026]   The DVR 110 preferably contains a CODEC 220 for receiving the television

content 112 or other video input signals from the video input 222 and outputting video

signals to the television 114 or other display device via the video output 224. Preferably,

the CODEC 220 digitizes the received television content and optionally compresses the

content using Moving Pictures Expert Group (MPEG) compression. The digitized

television content 214 is stored in the media storage 212. The CODEC 220 also